

three minutes and three-quarters of time to effect its decomposition,, which current must be powerful enough to retain a platina wire north of an inch in thickness/ red hot, in the air during the whole time; and if interrupted anywhere by charcoal points, will produce a very brilliant and constant star of light. If attention be paid to the instantaneous discharge of electricity of tension,, as illustrated in the beautiful experiments of Mr. Wheatstone,<sup>2</sup> and to what I have said elsewhere on the relation of common and voltaic electricity (107, in), it will not be too much to say that this necessary quantity of electricity is equal to a very powerful flash of lightning. Yet we have it under perfect command; can evolve, direct, and employ it at pleasure; and when it has performed its full work of electrolysation, it has only separated the elements of *a single grain of water*.

589. On the other hand, the relation between the conduction of the electricity and the decomposition of the water is so close . that one cannot take place without the other. If the water is altered only in that small degree which consists in its having the solid instead of the fluid state, the conduction is stopped, and the decomposition is stopped with it. Whether the conduction be considered as depending upon the decomposition, or not (149, 438), still the relation of the two functions is equally intimate and inseparable.

590. Considering this close and twofold relation, namely, that without decomposition transmission of electricity does not occur; and, that for a given definite quantity of electricity passed, an equally definite and constant quantity of water or other matter is decomposed; considering also that the agent, which is electricity, is simply employed in overcoming electrical powers in the body subjected to its action; it seems a probable,

<sup>1</sup> I have not stated the length of wire used, because I find by experiment, as would be expected in theory, that it is indifferent. The same quantity of electricity which, passed in a given time, can heat an inch of wire of a certain diameter of red hot, can also heat a hundred, a thousand, or any length of the same wire to the same degree, provided the cooling circumstances are the same for every part in all cases. This I have proved by the volta-electrometer. I found that whether half an inch or eight inches were retained at one constant temperature of dull redness, equal quantities of water were decomposed in equal times. When the half inch was used, only the centre portion of wire was ignited. A fine

wire  
be used as a rough but ready regulator of a voltaic even  
current; for if it be  
made part of the circuit, and the larger wires be  
communicating with it  
shifted nearer to or further apart, so as to keep the portion  
of wire in the  
circuit sensibly at the same temperature, the current the  
passing through it  
will be nearly uniform.

<sup>2</sup> *Literary Gazette*, 1833, March I and 8. *Philosophical Magazine*, 1833, p. 204. *L'Institut*, 1833, p. 261.